UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/237,356	01/26/1999	SANDEEP CHENNAKESHU	027575-174	7645

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EXAMINER
KUMAR, PANKAJ

ART UNIT	PAPER NUMBER
2631	

DATE MAILED: 09/09/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 07-01)

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 July 2002* .

2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

    If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

        1.☐ Certified copies of the priority documents have been received.

        2.☐ Certified copies of the priority documents have been received in Application No. _____ .

        3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

    a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1)☐ Notice of References Cited (PTO-892)
2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3)☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4)☐ Interview Summary (PTO-413) Paper No(s). _____ .
5)☐ Notice of Informal Patent Application (PTO-152)
6)☐ Other: .

U.S. Patent and Trademark Office

PTO-326 (Rev. 04-01)   Office Action Summary   Part of Paper No. 15

DETAILED ACTION

Response to Arguments

1.   Applicant's arguments filed 7/26/2002 have been fully considered but they are not

persuasive.

2.   Applicant's assertions that branch metrics in Kumar are not applied to a receiver and an

MLSE equalizer are incorrect. Kumar states in col. 33 lines 24 to 30: "FIG. 14(a) is a block

diagram of the codeword diversity selector in the FIG. 9 receiver system when the determination

to select between upper and lower sideband codeword estimates (or to combine estimates and

decode) is made by comparing the accumulated branch metrics computed in the Viterbi decoding

algorithm at the known terminating state, for convolutional codes." Kumar states in paragraph

85 " ... maximum-likelihood Viterbi decoding ... ". Maximum-likelihood Viterbi decoding

performs maximum likelihood sequence estimation (MLSE). The Viterbi decoder is shown in

fig. 14A which is part of the receiver shown in fig. 9 which has an equalizer and hence MLSE

equalization is being performed.

3.   In response to applicant's argument that the references fail to show certain features of

applicant's invention, it is noted that the features upon which applicant relies (i.e., non-linear

equalizer) are not recited in the rejected claim(s). Although the claims are interpreted in light of

the specification, limitations from the specification are not read into the claims. See *In re Van

Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

4.   Contrary to applicant's assertion, the fact that precomputation and hypothetical symbol

values are in Kumar is correct. Kumar in fig. 9 shows filters 204 and 209 (equalization involves

filtering and paragraph 65 states the equalizer is adaptive). Filtering and equalizing inherently

involve convolving a signal with a set of coefficients. When the system starts, the equalizer

initially has some hypothetical symbols or coefficients that it uses during convolution to

precompute an output and also precompute the next set of equalizer coefficients. Thus the initial

output of an equalizer (when the coefficients are not as stable as when the system has been

running for some time) may not be as good as a later output and that is why it is called

precomputation.

5.   As per applicant's assertion that Kumar does not show a look-up product table is

incorrect. In fig. 9 of Kumar, storing said pre-computed values in a product look-up table

(Kumar col. 43 lines 43-45:part of convolution; col. 31: lines 25-27 "accumulated"; the set of

adaptive coefficients is the look-up table); adding select pre-computed values from said product

look-up table to produce a result (Kumar col. 43 lines 43-45: part of convolution; col. 31: lines

25-27 "accumulated"; filter coefficients are convolved by input symbols where convolution

inherently means multiplying, storing, and adding).

6.   Contrary to applicant's assertion, complex number corresponds to channel coefficient

since Kumar's system is working on complex signals as recited in paragraph 31 and the

coefficients are adaptively changing based on the complex (I,Q) input signals.

Claim Rejections - 35 USC § 102

1.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United
> States before the invention thereof by the applicant for patent, or on an international application by another who

has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

2.   Claims 1,2,4,5,6,7,9,10,12,13 are rejected under 35 U.S.C. 102(e) as being anticipated by Kumar US patent no. 5,949,796.

3.   Regarding claim 1, Kumar teaches a method for determining a branch metric (col. 31) in a maximum-likelihood sequence-estimation equalizer (fig. 9) which receives at least one antenna signal (fig. 9: input to 201) modulated with M-ary modulation (col. 65: line 67; col. 33:paragraph 8), said method comprising the steps of: pre-computing values equal to a product of a complex number and a hypothetical symbol value (Kumar col. 43 lines 43-45: filter coefficients are convolved by input symbols where convolution inherently means multiplying, storing, and adding); storing said pre-computed values in a product table (Kumar col. 43 lines 43-45:part of convolution; col. 31: lines 25-27 "accumulated"); adding select pre-computed values from said product table to produce a result (Kumar col. 43 lines 43-45: part of convolution; col. 31: lines 25-27 "accumulated"); and determining said branch metric using said result (Kumar col. 31: lines 25-27 "accumulated ... branch metrics ... are compared").

4.   Regarding claim 2, Kumar teaches the method of claim 1 wherein said complex number

corresponds to a channel coefficient (Kumar col. 43 lines 43-45).

5.   Regarding claims 4, 5, 9, and 13, the discussion for claims 1 and 2 above apply.

6.   Regarding claim 6, Kumar teaches the filter according to claim 5 wherein said branch

metric is an Ungerboeck branch metric (Kumar col. 48 lines 31-32).

7.   Regarding claim 7, Kumar teaches the filter according to claim 5 wherein said branch

metric is an Euclidean branch metric (Kumar col. 51 line 52).

8.   Regarding claims 10 and 12, the above discussion for claims 6 and 7 apply.

Claim Rejections - 35 USC § 103

9.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in
> section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are
> such that the subject matter as a whole would have been obvious at the time the invention was made to a person
> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the
> manner in which the invention was made.

10.   Claims 3, 8 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kumar

in view of Arslan et al. US patent no. 6,108,517.

11.   Regarding claim 3, Kumar teaches the method of claim 1. Kumar also teaches complex

filter coefficients as discussed in claim 2. What Kumar does not teach is a reference to an s-

parameter. What Arslan teaches is a reference to an s-parameter (fig. 9). It would have been

obvious to one skilled in the art at the time of the invention to modify Kumar to have the s-

parameter reference of Arslan. One would be motivated to do so since Arslan teaches in fig. 9

that the s-parameter is used in conjunction with filter outputs for metric processing.

12.   Regarding claim 8, Kumar teaches the filter according to claim 5. What Kumar does not

teach is that said branch metric is a partial Ungerboeck branch metric. What Arslan teaches is

that said branch metric is a partial Ungerboeck branch metric (Arslan et al. col. 11 lines 30-32).

It would have been obvious to one skilled in the art at the time of the invention to modify Kumar

to have the partial Ungerboeck branch metric. One would be motivated to do so since Arslan

states that many other metric variations are possible in lines 30 to 31 of col. 11.

13.   Regarding claim 11, the discussion for claim 8 applies.

Conclusion

14.   **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time

policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

MONTHS of the mailing date of this final action and the advisory action is not mailed until after
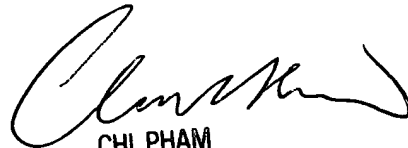
the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the mailing

date of this final action.

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Pankaj Kumar whose telephone number is (703) 305-0194. The

examiner can normally be reached on Monday through Thursday after 8AM to after 6:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Chi H. Pham can be reached on (703) 305-4378. The fax phone numbers for the

organization where this application or proceeding is assigned are (703) 872-9314 for regular

communications and (703) 872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding

should be directed to the receptionist whose telephone number is (703) 305-3800.

PK
September 4, 2002

CHI PHAM
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600 9/6/02